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EFFECT OF COMPUTER ASSISTED INSTRUCTIONAL PACKAGE ON THE PERFORMANCE OF STUDENTS IN MATHEMATICS IN ILORIN METROPOLIS

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Abstract

The purpose of this study was to determine the effect of computer assisted instructional package on the performance of students in Mathematics in Ilorin metropolis. The pretest, posttest control group design was used for the study. Eighty (80) students were randomly selected (40 males and 40 females) from two secondary schools that took part in the study. The students were randomly assigned to the experimental and control groups respectively. The subjects in the experimental group were taught using computer assisted instructional package (CAI) on quadratic equation while the control group were taught using conventional method. The treatment for the study was the CAI package used and the main instrument used was Computer Assisted Mathematics Achievement Test (CAMAT). Both the instrument and the treatment were subjected to content and face validation. A 25-item Computer Assisted Mathematics Achievement test was administered to the students as pretest and posttest. Two hypotheses were postulated and tested at 0.05 level of significance. From the analysis, the following findings were reached. (1) There was a significant difference between the achievement scores of students taught mathematics with CAI package and those taught using conventional method ($t = 15.74$, $df = 39$, $p \leq 0.05$) (2) There was no significant difference between the mean achievement scores of male and female students taught Mathematics with CAI package ($t = 0.31$, df

= 19, P ≥ 0.05). Based on these findings, it is recommended that Mathematics teachers should be encouraged to use CAI package for teaching related concepts in Mathematics.

Keywords: CAI, Students' Performance, Gender, Mathematics Achievement Test

Introduction

The feasible application of micro computer in the Nigerian classroom for teaching and learning is gradually gaining recognition as a result of great importance and educational appropriateness it offers. In the developing countries according to Award (1988), computers are becoming increasingly popular, especially as these form integral part of everyday activities that generated kind information and facilitated its fast delivery. Computer can be used to assist instruction, manage instruction and aid design. However, when computer is used to assist instruction, it is referred to as 'Computer Assisted Instruction'.Computer Assisted Instruction according to Abimbola, (1988), is the term used to describe the use of computers to provide instruction directlyto students in order to simulate teaching and learning situation. It is an instructional programme presented by means of a computer or computer system (Ekiregwo, 2001). In another development, Moore (1994) referred to CAI as an educational material for instruction and remediation presented on a computer. CAI according to Fakomoghon (2002) isa set of materials put on audio disk that can be displayed on the computer screen whenever there is need for students to use them.

The following are the benefits of CAI according to Ekiregwo (2001):

1. Automated abilities to give instructions and all for response, feedback mechanism, evaluation and assessment facilities. That is, all coded or programmed are presented in an existing and captivating interphase that is simply beauty to behold;
2. It makes learning exciting, interesting and challenging;
3. It enables the teachers to know the academic strength and deficit of learners;
4. It makes learning flexible for student so that it is possible to work at the individual owns speed; and
5. With CAI, students can work anywhere there is computer with or without internet connection.

Sanni and Osungbemiro (2003) assertthat what makes CAI most interesting is the degree of information between the users and the machine as facilitated by colourful and attractive machine interphase. Also with CAI, students can be brought in to a computerized environment. To use any CAI in learning, students must first obtain a general knowledge of how to work

on hardware and software. Students need to learn to navigate the mouse by practicing or playing games on the computer to develop skill with the peripheral devices. To create active learning using CAI, students must understand the material and see how the concepts fit together, combine and the information in their own minds, apply the information is a useful way, receive feedback and act on the feedback.

Lowe (2001) finds that students in High School biology who have interactive video-disc/computer lessons indicate an overall level satisfaction with the strategy. As stressed further, video disc instruction gives more efficient use of instructional time than the conventional mode. Ciwar (2005) explains that the use of computer in teaching decreases situation where students could be embarrassed in class for not knowing answer to question being asked by the teacher. Wilson (1988) asserts that using computer technology in science and Mathematics derives its capacity to present educationally powerful, dynamic, visual images as different representations of a complex idea may exist. Cohen (1994), finds that computer simulated experiences are found effective as hands-on-laboratory work.

In addition, it was revealed from the literature that, Teachers who use CAI often implement it as an additional instruction and regular reading programme, meaning that children using CAI are receiving additional instruction and practice in reading. Also, it was reported that CAI programmes designed using research-based teaching strategies were found to be highly effective and that students taught through CAI as supplementary strategy performs significantly better them the other students (http://tinyuri. Com). Added to that, Ford, Mazzone and Taylor (2005) were of the view that students exposed to computer Assisted instruction in the learning of Musculos skeletal special Test Perform better then students exposed to traditional mode of instruction of the same task. Other Similar studies that gave credence to the importance of CAI are Jamaison, Suppes and Butler (1970), Bialozed, Fine, McLaughlin (1991), Caryl and Noonan (2000), Soe, Koki, and Chang (2000), Busturk (2005), Maitoned, Dupaul and Jitendra (2005) and Liao (2007).

Mathematics is the study of quantity, structure, space and change. It is also the science of patterns and relationships. As a theoretical discipline, mathematics explores the relationships among abstractions without concern for whether those abstractions have counterparts in the real world. According to Wasagu and Mohammed (2007), the abstraction can be anything from strings of numbers to geometrical figures to sets of equations. Mathematics relies on both logic and creativity and it is pursued for varieties of practical purposes and for intrinsic interests. Since Mathematics is one of the compulsory subjects in Nigerian secondary schools, students need varieties

of innovative media to aid perfect understanding of the abstract concepts in the subject.

Statement of the problem

There are different innovations that are being applied in the delivery of curriculum content to students. Research evidence shows that the use of CAI could bring about improvement in students' achievement, speeds up learning rate, enhances better retention, and encourages the development of better attitude. However, in reference to Eegunjobi's (2000) assertion, there is need to really find out, whether the use of computer assisted instructional package on quadratic equation will produce any difference in the performance of students in quadratic equation.

Purpose of the study

The study examined the effect of the Computer Assisted Instructional Package for teaching quadratic equation in the Senior Secondary School Mathematics in Ilorin Metropolis and it further examined the differences in the performance of students in terms of gender.

Research questions

The study sought to answer two research questions below:

1. Is there any difference in the academic performance of students exposed to computer assisted instructional package and those taught using conventional method?
2. Is there any difference in the performance of male and female students exposed to computer assisted instructional package?

Research hypothesis

1. There is no significant difference between the mean achievement scores of mathematics students taught with the CAI and those taught with conventional method.
2. There is no significant difference between the mean achievement scores of male and female mathematics students taught with the CAI.

Sample and sampling technique

The research design was a pre-test-post-pest experimental control group design.The population for this study was made up of the entire senior secondary class one (SSI) student in two Local Government Areas of Kwara State. The sample subjects were drawn from two co-educational and two single gender schools in Asa and Kwara South Local Government AreaofKwara State. The subjects from co-educational schools were selected by the use of stratified random sampling technique. This method was chosen

so that the gender variable could be appropriately represented. Twenty (20) mathematics students were randomly selected for the study from each of the fourschools. In all there were forty (40) males and forty (40) females. The students were taught the same concept of quadratic equation using conventional method and computer assisted instructional package.

Research instrument

The main instrument used in generating data for this study was the computer Assisted Mathematics Achievement test (CAMAT) which is made up of twenty-five (25) multiple choice objective items designed to measure specific learning outcomes related to the concept of the study. The instrument was validated for the face and content validity and it was further subjected to pilot study, and reliability test (0.86) before using them as a research instrument.

A stem is followed by four (4) options lettered (A-E) out of which only "one" was correct. Students were instructed to select only one option as answer for each item. All the options were plausible answers to the item.The computer assisted instructional package was developed by the researcher using the lesson notes prepared for the conventional (talk and chalk method. The story board was designed for the topic chosen (Quadratic Equation) and it was developed by the researcher with the assistant of video editor using Adobe premiere 1.5 version software. The topic treated was selected based on Senior Secondary School syllabus. The development of CAI followed a systematic approach of instructional development model put forward by Dick and Carey (1996).

However, three trials were made before the package become successful. It was then test with few selected secondary schools in Ilorin metropolis. These schools used for testing the package falls between the population of the study but not part of the schools selected for research study. Some of the complaints from these selected students about the package was later used for further modification in order to get the final package used for the experiment.

Validity and realiability of reseach instrument

The Computer Assisted Instructional Package (Mathematics package lesson and theComputer Assisted Mathematics Achievement Test (CAMAT items were pilot tested and found to satisfy face, content and construct validity by three experts in Educational Technology, Mathematics and Computer Science Departments. Item analysis of the instrument was also carried out to determine the facility and discrimination indices after which the final items for the instrument were selected and the reliability coefficient computer computed using the split-half approach and the Richard Kuderson

formula 21CKR-2).The value obtained for the reliability coefficient was 0.86 and this was considered to be quite adequate for this study.

Method of data collection

The data for testing the hypotheses were collected from the pretest and posttest administered to the subjects used in the study. Each of the test was marked and scored over hundred percent. The experimental groups were exposed to Mathematics lesson using Computer Assisted Instructional Package for the period of six weeks while the control group were taught the Mathematics lesson with conventional (talk and chalk) method. The total number of lesson within four weekswastwelve periods lasted for forty minutes.After the duration of four weeks of treatment for the experimental group and four weeks of conventional method with control group, posttest was administered to both groups at the same duration in the usual paper per-pencil method.

Method of data analysis

The scores obtained from two intact classes of 48 and 52 students which were later randomly selected into 40 students experimental group and 40 students control group were computed and used in testing hypotheses. These data were analyzed using mean, standard deviation and the t-test statistical analysis. The level of the significance adopted for the analysis was $P \leq 0.05$. This level of significance formed the basis for accepting orrejecting each of the hypotheses.

Results and discussion

Two research questions were raised in this study and two null hypotheses were formulated and tested to provide answers to the research question. Analysis of the pretest and posttest data collected by means of the computer assisted mathematics test (CAMAT) were used to answer the research question using the two null hypotheses as guide. Means, standard deviations and the t-test we employed in analyzing the pretest and posttest data. The level of significance adopted for the analysis 0.05. This level of significance formed the basis for rejecting or not rejecting a null hypothesis. The summary of the data analyzed and results are presented below:

Table 1 depicted the Performance of Experimental and Control Groups on the pretest. A pretest was administered to both the experimental and control groups. The test was the 25-item multiple choice Computer Assisted Mathematics Test (CAMAT). The subject was allowed forty minutes to do the test. The test was given to determine the academic equivalence of the experimental and control groups. The mean scores of students in the experimental and control groups on the pretest were

calculated and the t-test computed for the two means. Table 1 shows the means, standard deviations and the result of the t-test analysis.

Table 1*:* T-test comparison of the mean scores of experimental and control group.

Variable	**N**	**Df**	**$\bar{X}$**	**SD**	**t-value critical calculated**	**t – value critical**	**P**	**Remark**
Experimental	40		14.43	2.91				
Group		39			0.24ns	2.02	0.81	Not significant.
Control Group	40		14.35	3.13				

ns- Not significant at $P \leq 0.05$

The result in Table 1indicated no significant difference at 0.05 level of the significance between the pretest mean scores of the experimental and controls groups ($t = 0.24, df = 39, p > 0.05$). This would mean that subjects in the experimental and control groups were at the same entry level with regard to academic ability before the Mathematics topic was presented to them.

Performance of the experimental groups on the posttest

HYPOTHESIS1: There is no significant difference between the mean achievement scores of Mathematics Students taught with computer Assisted Instructional Package (CAI) and those taught with conventional method.

To test this hypothesis, the posttest means scores of the experimental and control groups were computed and compared using the t- test statistic. The result is shown in table 2.

Table 2*:* T-test comparison of the posttest mean scores of the experimental and control groups.

Variable	**N**	**Df**	**$\bar{X}$**	**SD**	**t-value critical calculated**	**t – value critical**	**P**	**remarks**
Experimental	40		68.95	5.99				
Group		39			15.74*	2.02	0.001	Significant.
Control Group	40		58.90	5.38				

Significant at ≤ 0.05

The result of the t-test analyses in table 2 showed that there was significant difference between the posttest mean scores of the experimental and control groups at 0.05 level of significant ($t = 15.74, df = 39, p \leq 0.05$). Hypothesis 1 was therefore, rejected. This implied that there was a significant difference between the performances of students taught with CAI and those taught without the CAIat (0.05 level of significance). Students

taught with CAI performed better than those who were taught with conventional method. Hence, CAI enhanced learning of mathematics.

Performance of male and female students in the experimental group on the posttest

HYPOTHESIS 2: There is no significant difference between the mean achievement scores of male and female mathematics students taught with CAI.

To test this hypothesis, the posttest mean scores of male and female students in the experimental group were computed. The analysis was carried out using the t-test statistics and the result shown in table 3.

Table 3: T-test comparison of the posttest mean scores of male and female Mathematics Students in the Experimental Group.

Variable	N	df	-- X	SD	t-value critical calculated	t – value critical	P	remark
MALES	20		68.70	6.37				
Group		19			0.31ns	2.09	0.757	Not significant.
Females	20		69.20	5.75				

NS – Not significant at ≤ 0.05

From the result in table 3, it was shown that there was no significant difference between the posttest mean scores of male and female mathematics students in the experimental group at 0.05 level of significance ($t = 0.31$, $df = 19$, $p \geq 0.05$). Null hypothesis 2 was therefore accepted. The performances of male and female taught mathematics in the experimental group were equally enhanced by the use of the computer Assisted Instructional Package.Hence the CAI package was gender friendly.

Discussion

The finding on Table 2 revealed that there was a significant difference in the mathematics achievement of students taught with the Computer Assisted Instructional package performed better in the Mathematics Achievement Test compared with those who were taught with conventional method. The result would seemingly agree with earlier studies which concluded that students taught physics with computer achieved higher cognitively than those taught with conventional method (Adeniyi, 1997). Computer could, therefore, be seen as a tool for effective teaching and learning of Science subjects. CAI can also be seen as effective tool for developing individual cognitive structure, psychomotor and affective abilities.

The findings on Table 3 indicated that there was no significant difference between the performances of male and female students who were

taught mathematics with the computer Assisted Instructional package. The male and female students performed equally well. The result agrees with the findings of Abdullahi (1981) who found that gender did not influence students' performance in Science generally.

Conclusion

From the findings of this research work, the following conclusions were drawn:

1. Teachers' instructional strategies employ in teaching Mathematics subjects at senior secondary school level have significant effects on students achievement. The findings showed that better performance in Mathematics was achieved through the use of CAI package.
2. the male and female students were affected positively and equally by the use of CAI package in teaching mathematics. The effect of CAI package is not gender dependent.

Recommendations

From the findings of the present study, the following recommendations are made:

1. curriculum planners should encourage the use of computer in teaching/ learning in our educational systems.
2. computer education be made compulsory for teachers and students at all levels of our educational systems.
3. In-service training shouldbe given to teachers on the production and the use of computerized instructional media so that they can appropriately use the modern instructional technology.
4. School shouldbe equipped with computers and internet facilities and other necessary instructional packages for teaching and learning.

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